propagating within portions of said first region other than along said path, and in which each of said second regions of said second group has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said path from said input toward said output;

providing a material having an index of refraction; and

causing each of said second regions of said second group to have said material therein during one of said first and second operational modes, and to be free of said material during the other of said first and second operational modes.

26. (New) A method according to Claim 22, including the step of arranging said second regions within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.

REMARKS

The present application was previously allowed, and the issue fee had been paid. However, before the patent issued, Applicant petitioned to have the present application withdrawn from issue, in order to permit filing of a Request for Continued Examination (RCE), followed by an Information Disclosure Statement. The Petition was granted in a Decision mailed on January 22, 2003. The RCE accompanied the Petition, and the Information Disclosure Statement is being filed concurrently with this Amendment. The Information Disclosure Statement submits art cited in a PCT application that

corresponds to the present application. This Amendment modifies the claims in order to more clearly emphasize the features which are distinctive of the present invention.

More specifically, Claims 1, 3, 12, 18 and 20 have been canceled, Claims 2, 4-5, 7, 13-14, 16, 19 and 21-22 have been amended, and Claims 23-26 have been added. Claims 6, 8-11, 15 and 17 remain in the application unchanged. Claims 2, 4-11, 13-17, 19 and 21-26 are thus presented for examination.

In the foregoing amendments, the limitations of Claims 1 and 3 have been added to each of Claims 4 and 5, in order to place Claims 4 and 5 in independent form. The limitations of Claim 1 have been added to Claim 7, in order to place Claim 7 in independent form. The limitations of Claim 12 have been added to each of Claims 14 and 16, in order to place Claims 14 and 16 in independent form. The limitations of Claims 18 and 20 have been added to Claim 21, in order to place Claim 21 in independent form. The limitations of Claim 18 have been added to Claim 22, in order to place Claim 22 in independent form. These amendments are not intended to affect the scope of Claims 4-5, 7, 14, 16 and 21-22.

Further and favorable consideration of the present application is respectfully requested.

Respectfully submitted,
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Date: January 29, 2003

Enclosures: Marked-Up Version of Amended Claims
Amendment Transmittal
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MARKED-UP VERSION OF AMENDED CLAIMS

Please cancel Claims 1, 3, 12, 18 and 20 without prejudice.

4. **(Amended)** [An apparatus according to Claim 3,] **An apparatus comprising an optical switch which includes:**

an input for optical radiation;

an output spaced from said input; and

a first region disposed optically between said input and said output, said first region including a plurality of second regions and a third region, said second regions being provided at spaced locations within said first region, and said third region having an index of refraction and being a portion of said first region other than said second regions;

said second regions including first and second groups of said second regions which are mutually exclusive, said second regions of said second group being arranged along a path which extends through said first region from said input to said output and which is free of said second regions of said first group;

said switch having a first operational mode in which each of said second regions has an index of refraction different from said index of refraction of said third region so that said third region and said second regions cooperate to prevent optical radiation with a predetermined wavelength from propagating within said first region;

said switch having a second operational mode in which each of said second regions of said first group has an index of refraction different from said index of refraction of said third region so that said third region and said second regions

of said first group cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said path, and in which each of said second regions of said second group has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said path from said input toward said output;

wherein each of said second regions of said second group has therein a portion of a material with different operational states in which said material has respective different indexes of refraction;

including structure for facilitating selective control of each said portion of said material so as to cause each said portion to be in a selected one of first and second states in which said portion respectively has first and second indexes of refraction when said switch is respectively in said first and second operational modes, said first and second indexes of refraction being different; and

wherein said material is a liquid crystal material.

2. **(Amended)** An apparatus according to Claim [1] **4**, wherein said second regions are arranged within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.

5. **(Amended)** [An apparatus according to Claim 3,] **An apparatus comprising an optical switch which includes:**

an input for optical radiation;

an output spaced from said input; and

a first region disposed optically between said input and said output, said first region including a plurality of second regions and a third region, said second regions being provided at spaced locations within said first region, and said third region having an index of refraction and being a portion of said first region other than said second regions;

said second regions including first and second groups of said second regions which are mutually exclusive, said second regions of said second group being arranged along a path which extends through said first region from said input to said output and which is free of said second regions of said first group;

said switch having a first operational mode in which each of said second regions has an index of refraction different from said index of refraction of said third region so that said third region and said second regions cooperate to prevent optical radiation with a predetermined wavelength from propagating within said first region;

said switch having a second operational mode in which each of said second regions of said first group has an index of refraction different from said index of refraction of said third region so that said third region and said second regions of said first group cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said path, and in which each of said second regions of said second group has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said

predetermined wavelength to propagate through said first region along said path from said input toward said output;

wherein each of said second regions of said second group has therein a portion of a material with different operational states in which said material has respective different indexes of refraction;

including structure for facilitating selective control of each said portion of said material so as to cause each said portion to be in a selected one of first and second states in which said portion respectively has first and second indexes of refraction when said switch is respectively in said first and second operational modes, said first and second indexes of refraction being different;

wherein said switch includes a member which corresponds to said third region, which has said index of refraction, and which has therethrough a plurality of spaced and parallel openings that each correspond to a respective one of said second regions; and

wherein a subset of said openings corresponds to said second group, and each of said openings in said subset has therein a respective said portion of said material.

23. (New) An apparatus according to Claim 5, wherein said second regions are arranged within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.

7. **(Amended)** [An apparatus according to Claim 1,] **An apparatus comprising an optical switch which includes:**

an input for optical radiation;

an output spaced from said input; and

a first region disposed optically between said input and said output, said first region including a plurality of second regions and a third region, said second regions being provided at spaced locations within said first region, and said third region having an index of refraction and being a portion of said first region other than said second regions;

said second regions including first and second groups of said second regions which are mutually exclusive, said second regions of said second group being arranged along a path which extends through said first region from said input to said output and which is free of said second regions of said first group;

said switch having a first operational mode in which each of said second regions has an index of refraction different from said index of refraction of said third region so that said third region and said second regions cooperate to prevent optical radiation with a predetermined wavelength from propagating within said first region;

said switch having a second operational mode in which each of said second regions of said first group has an index of refraction different from said index of refraction of said third region so that said third region and said second regions of said first group cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said path, and in which each of said second regions of said second group has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said

predetermined wavelength to propagate through said first region along said path from said input toward said output;

including a material having an index of refraction; and

including structure for causing each of said second regions of said second group to have said material therein during one of said first and second operational modes, and to be free of said material during the other of said first and second operational modes.

24. (New) An apparatus according to Claim 7, wherein said second regions are arranged within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.

14. **(Amended)** [An apparatus according to Claim 12,] **An apparatus, comprising a switch which includes:**

an input for optical radiation;

first and second outputs spaced from said optical input and from each other; and

a first region disposed optically between said input and each of said outputs, said first region including a plurality of second regions and a third region, said second regions being provided at spaced locations within said first region, and said third region having an index of refraction and being a portion of said first region other than said second regions;

said second regions being arranged in first, second, third and fourth groups of said second regions which are mutually exclusive, said second regions of said second and third groups being arranged along a first path which extends

through said first region from said input to said first output and which is free of said second regions of said first and fourth groups, and said second regions of said second and fourth groups being arranged along a second path which extends through said first region from said input to said second output and which is free of said second regions of said first and third groups;

said switch having a first operational mode in which each of said second regions has an index of refraction different from said index of refraction of said third region so that said third region and said second regions cooperate to prevent optical radiation with a predetermined wavelength from propagating within said first region;

said switch having a second operational mode in which each of said second regions of said first and fourth groups has an index of refraction different from said index of refraction of said third region so that said third region and said second regions of said first and fourth groups cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said first path, and in which each of said second regions of said second and third groups has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said first path from said input toward said first output;

said switch having a third operational mode in which each of said second regions of said first and third groups has an index of refraction different from said index of refraction of

said third region so that said third region and said second regions of said first and third groups cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said second path, and in which each of said second regions of said second and fourth groups has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said second path from said input toward said second output;

wherein said switch includes a member which corresponds to said third region, which has said index of refraction, and which has therethrough a plurality of spaced and parallel openings that each correspond to a respective one of said second regions;

wherein a subset of said openings corresponds to said second, third and fourth groups, and each said opening in said subset has therein a respective portion of a liquid crystal material; and

including structure for facilitating selective control of each said portion of said material so as to cause each said portion to be in a selected one of first and second states in which said portion has respective different indexes of refraction.

13. **(Amended)** An apparatus according to Claim [12] **14**, wherein said second regions are arranged within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.

16. **(Amended)** [An apparatus according to Claim 12,] **An apparatus, comprising a switch which includes:**

an input for optical radiation;

first and second outputs spaced from said optical input and from each other; and

a first region disposed optically between said input and each of said outputs, said first region including a plurality of second regions and a third region, said second regions being provided at spaced locations within said first region, and said third region having an index of refraction and being a portion of said first region other than said second regions;

said second regions being arranged in first, second, third and fourth groups of said second regions which are mutually exclusive, said second regions of said second and third groups being arranged along a first path which extends through said first region from said input to said first output and which is free of said second regions of said first and fourth groups, and said second regions of said second and fourth groups being arranged along a second path which extends through said first region from said input to said second output and which is free of said second regions of said first and third groups;

said switch having a first operational mode in which each of said second regions has an index of refraction different from said index of refraction of said third region so that said third region and said second regions cooperate to prevent optical radiation with a predetermined wavelength from propagating within said first region;

said switch having a second operational mode in which each of said second regions of said first and fourth groups has an index of refraction different from said index of refraction of said third region so that said third region and said second regions of said first and fourth groups cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said first path, and in which each of said second regions of said second and third groups has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said first path from said input toward said first output;

said switch having a third operational mode in which each of said second regions of said first and third groups has an index of refraction different from said index of refraction of said third region so that said third region and said second regions of said first and third groups cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said second path, and in which each of said second regions of said second and fourth groups has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said second path from said input toward said second output;

including a material having an index of refraction; and

including structure for causing each of said second regions of said second and third groups to have said material

therein during one of said first and second operational modes, and to be free of said material during the other of said first and second operational modes, and for causing each of said second regions of said second and fourth groups to have said material therein during one of said first and third operational modes, and to be free of said material during the other of said first and third operational modes.

25. (New) An apparatus according to Claim 16, wherein said second regions are arranged within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.

21. **(Amended)** [A method according to Claim 20, including the step of] **A method of operating an optical switch which includes an input for optical radiation, an output spaced from said input, and a first region disposed optically between said input and said output, including the steps of:**

providing within said first region a plurality of second regions and a third region, said second regions being provided at spaced locations within said first region, and said third region having an index of refraction and being a portion of said first region other than said second regions;

subdividing said second regions into first and second groups which are mutually exclusive, said second regions of said second group being arranged along a path which extends through said first region from said input to said output and which is free of said second regions of said first group;

selectively operating said switch in first and second operational modes, wherein in said first operational mode each of said second regions has an index of refraction different from said index of refraction of said third region so that said third region and said second regions cooperate to prevent optical radiation with a predetermined wavelength from propagating within said first region, and wherein in said second operational mode each of said second regions of said first group has an index of refraction different from said index of refraction of said third region so that said third region and said second regions of said first group cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said path, and in which each of said second regions of said second group has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said path from said input toward said output;

providing within each of said second regions of said second group a portion of a material that has different operational states in which said material has respective different indexes of refraction;

effecting selective control of each said portion of said material so as to cause each said portion to be in a selected one of first and second states in which said portion respectively has first and second indexes of refraction when said switch is respectively in said first and second operational modes, said first and second indexes of refraction being different; and

selecting a liquid crystal material for use as said portions of said material.

19. **(Amended)** A method according to Claim [18] **21**, including the step of arranging said second regions within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.

22. **(Amended)** [A method according to Claim 18, including the steps of:] **A method of operating an optical switch which includes an input for optical radiation, an output spaced from said input, and a first region disposed optically between said input and said output, including the steps of:**

providing within said first region a plurality of second regions and a third region, said second regions being provided at spaced locations within said first region, and said third region having an index of refraction and being a portion of said first region other than said second regions;

subdividing said second regions into first and second groups which are mutually exclusive, said second regions of said second group being arranged along a path which extends through said first region from said input to said output and which is free of said second regions of said first group;

selectively operating said switch in first and second operational modes, wherein in said first operational mode each of said second regions has an index of refraction different from said index of refraction of said third region so that said third region and said second regions cooperate to prevent

optical radiation with a predetermined wavelength from propagating within said first region, and wherein in said second operational mode each of said second regions of said first group has an index of refraction different from said index of refraction of said third region so that said third region and said second regions of said first group cooperate to prevent radiation with said predetermined wavelength from propagating within portions of said first region other than along said path, and in which each of said second regions of said second group has an index of refraction selected in relation to said index of refraction of said third region so as to permit radiation with said predetermined wavelength to propagate through said first region along said path from said input toward said output;

providing a material having an index of refraction; and

causing each of said second regions of said second group to have said material therein during one of said first and second operational modes, and to be free of said material during the other of said first and second operational modes.

26. (New) A method according to Claim 22, including the step of arranging said second regions within said first region in a periodic pattern so that said second and third regions together define a photon band gap arrangement in said first operational mode.